

WHAT IS CLAIMED IS:

1. A probe for deploying electrode arrays, said probe comprising:  
2 a shaft having a distal end and a proximal end;  
3 a first array of electrodes mounted on the shaft to shift between a retracted  
4 configuration and a deployed configuration having a concave face; and  
5 a second array of electrodes mounted on the shaft at a location spaced-  
6 apart proximally from first array of electrodes, wherein the second electrode array shifts  
7 between a retracted and a deployed configuration having a concave face;  
8 wherein concave faces are opposed to each other when the arrays are  
9 deployed.

1                           2.     A probe as in claim 1, wherein the first and second electrode arrays  
2     each comprise a plurality of individual electrodes which initially move axially and then  
3     evert as they are deployed.

1                           4.     A probe as in claim 1 or 3, wherein the shaft has at least once  
2 cavity for receiving the first and second electrode arrays when retracted.

5. A probe as in claim 1 or 3, wherein the shaft has at least one cavity  
for receiving the first electrode array when retracted and at least a second cavity for  
receiving the second electrode array when retracted.

1                   6.        A probe as in claim 1 or 3, further comprising:  
2                    a first rod connected to the first electrode array and slidably disposed in  
3                   the shaft, wherein distal advancement of the first rod relative to the shaft causes the first  
4                   electrode array to deploy distally;

5 a second rod connected to the second electrode array and slidably disposed  
6 in the shaft, wherein proximal retraction of the second rod relative to the shaft causes the  
7 second electrode array to deploy proximally.

4 first and second areas are spaced-apart along a line between their respective centers by a  
5 distance in the range between 2 cm to 10 cm.

1 8. A probe as in claim 1 or 3, wherein the volume between the first  
2 electrode array when deployed and the second electrode when deployed is in the range  
3 from 30 cm<sup>3</sup> to 150 cm<sup>3</sup>.

1 9. A probe as in claim 8, wherein the volume is in the range from  
2 50 cm<sup>3</sup> to 70 cm<sup>3</sup>.

1 10. A probe as in claim 1 or 3, wherein the first electrode array and  
2 second electrode array are electrically isolated from each other, further comprising a first  
3 connector for connecting the first electrode array to one pole of a power supply and a  
4 second connector for connecting the second array to a second pole of a power supply.

1 11. A probe as in claim 10, further comprising a first axial conductor  
2 extending proximally along the shaft from the first electrode array to a location distal to  
3 the second electrode array, said first axial conductor being electrically coupled to the first  
4 electrode array.

1 12. A probe as in claim 11, wherein the first axial conductor extends  
2 proximally beyond the proximal terminus of the first electrode array so that the first axial  
3 conductor lies closer to the second electrode array than does any portion of the first  
4 electrode array.

1 13. A probe as in claim 11, further comprising a second axial  
2 conductor extending distally along the shaft from the second electrode array to a location  
3 proximal to the first axial conductor so that a gap exists between the first and second axial  
4 conductors, said second axial conductor being electrically coupled to the second electrode  
5 array.

1 14. A probe as in claim 13, wherein the second axial conductor extends  
2 distally beyond the distal terminus of the second electrode array so that the second axial  
3 conductor lies closer to the first electrode array than does any portion of the second  
4 electrode array.

1                   15. A probe as in claim 13, wherein the distance between the inner  
2 termini of the first and second axial conductors is from 0.25 to 0.75 of the distance  
3 between the inner termini of the innermost portions of the first and second electrode  
4 arrays.

1                   16. A method for treating a treatment region in tissue, said method  
2 comprising:

3                   deploying a first array of electrodes in tissue on one side of the treatment  
4 region, wherein said first electrode array has a concave face;

5                   deploying a second array of electrodes in tissue along an axis with the first  
6 array on another side of the treatment region, wherein said second electrode array has a  
7 concave face wherein the concave face of the first electrode array faces the concave face  
8 of the second electrode array; and

9                   applying electrical current between the first and second electrode arrays.

1                   17. A method as in claim 16, wherein deploying the first electrode  
2 array comprises introducing a first probe through tissue to a location on one side of the  
3 treatment region and advancing a first plurality of at least three electrodes from the probe  
4 in an everting pattern.

1                   18. A method as in claim 17, wherein deploying the second electrode  
2 array comprises advancing a second plurality of at least three electrodes from the probe in  
3 an everting pattern at a location on the other side of the treatment region.

1                   19. A method as in claim 17, wherein deploying the second electrode  
2 array comprises introducing a second probe through tissue to a location on the other side  
3 of the treatment region and advancing a plurality of at least three electrodes in an everting  
4 pattern.

1                   20. A method as in claims 16-19, wherein the tissue is selected from  
2 the group consisting of liver, lung, kidney, pancreas, stomach, uterus, and spleen.

1                   21. A method as in claim 20, wherein the treatment region is a tumor.

1                   22. A method as in claim 16-19, wherein electrical current is applied at  
2 a frequency in the range from 300 kHz to 1.2 MHz.

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1                   23. A method as in claim 22, wherein electrical current is applied at a  
2 power in the range from 50W to 300W.

1                   24. A method as in claims 16-19, wherein applying electrical current  
2 comprises coupling one pole of a radiofrequency power supply to the first electrode array  
3 and another pole of the radiofrequency power supply to the second electrode array and  
4 energizing the power supply.

1                   25. A method as in claims 16-19, wherein the first and second  
2 electrode arrays each span a planar area in the range between 3 cm<sup>2</sup> to 20 cm<sup>2</sup>, and  
3 wherein the first and second arrays are spaced-apart along a line between their respective  
4 centers by a distance in the range between 2 cm to 10 cm.

1                   26. A method as in claims 16-19, wherein the tissue volume between  
2 the first electrode array and the second electrode is in the range from 30 cm<sup>3</sup> to 150 cm<sup>3</sup>.

1                   27. A method as in claim 26, wherein the volume is in the range from  
2 50 cm<sup>3</sup> to 70 cm<sup>3</sup>.

1                   28. A method as in claims 16-19, wherein said first electrode array  
2 includes a first axial conductor extending at least part of the way to the second array  
3 along the axis therebetween.

1                   29. A method as in claim 28, wherein the first axial conductor extends  
2 proximally beyond the proximal terminus of the first electrode array so that the first axial  
3 conductor lies closer to the second electrode array than does any portion of the first  
4 electrode array.

1                   30. A method as in claim 28, wherein said second electrode array  
2 includes a second axial conductor extending part of the way to the first array along the  
3 axis therebetween and wherein there is a gap between termini of the first axial conductor  
4 and the second axial conductor.

1                   31. A method as in claim 30, wherein the second axial conductor  
2 extends distally beyond the distal terminus of the second electrode array so that the

3 second axial conductor lies closer to the first electrode array than does any portion of the  
4 second electrode array.

1 32. A method as in claim 31, wherein the distance between inner  
2 termini of the first and second axial conductors is from 0.25 to 0.75 of the distance  
3 between the inner termini of the innermost portions of the first and second electrode  
4 arrays.

1 33. A method for bipolar radiofrequency necrosis of tissue, said  
2 method comprising:

3 deploying a first array of electrodes in tissue on one side of a treatment  
4 region, wherein said first array has a transverse face and an axial conductor extending in  
5 an axial direction from the transverse face;

6 deploying a second array of electrodes in tissue on another side of the  
7 treatment region, wherein said second array has a transverse face and an axial conductor  
8 extending in an axial direction opposed to the axial conductor on the first electrode array;  
9 and

10 applying bipolar radiofrequency current to the tissue between the first and  
11 second electrode arrays.

1 34. A method as in claim 33, wherein deploying the transverse face of  
2 the first electrode array comprises introducing a first probe through tissue to a location on  
3 one side of the treatment region and advancing a first plurality of at least three electrodes  
4 from the probe in a radially diverging pattern.

1 35. A method as in claim 34, wherein the diverging pattern is evertting.

1 36. A method as in claim 34 or 35, wherein deploying the transverse  
2 second electrode array comprises advancing a second plurality of at least three electrodes  
3 from the probe in a radially diverging pattern at a location on the other side of the  
4 treatment region.

1 37. A method as in claim 36, wherein the diverging pattern is evertting.

1 38. A method as in claim 34 or 35, wherein deploying the transverse  
2 face of the second electrode array comprises introducing a second probe through tissue to

3 allocation on the other side of the treatment region and advancing a plurality of at least  
4 three electrodes in a radially diverging pattern.

1 39. A method as in claim 38, wherein the diverging pattern is evertting.

1 40. A method as in claims 33, 34, or 35, wherein the tissue is selected  
2 from the group consisting of liver, lung, kidney, pancreas, stomach, uterus, and spleen.

1 41. A method as in claim 40, wherein the treatment region comprises a  
2 tumor lesion.

1 42. A method as in claims 33, 34, or 35, wherein the bipolar  
2 radiofrequency current is applied at a frequency in the range from 300 kHz to 1.2 MHz.

1 43. A method as in claim 42, wherein the bipolar radiofrequency  
2 current is applied at a power in the range from 50W to 300W.

1 44. A method as in claims 33, 34, or 35, wherein applying the bipolar  
2 radiofrequency current comprises coupling one pole of a radiofrequency power supply to  
3 the first electrode array and another pole of the radiofrequency power supply to the  
4 second electrode array and energizing the power supply.

1 45. A method as in claims 33, 34, or 35, wherein the transverse face of  
2 the first electrode array spans a planar area in the range between 3 cm<sup>2</sup> to 20 cm<sup>2</sup>, the  
3 transverse face of the second electrode array spans a planar area in the range between  
4 3 cm<sup>2</sup> and 20 cm<sup>2</sup>, and the first and second arrays are spaced-apart along an axial line  
5 between their respective centers by a distance in the range between 2 cm and 10 cm.

1 46. A method as in claim 45, wherein the termini of axial conductors  
2 of the first and second electrode arrays are spaced-apart in the axial direction by a  
3 distance in the range between 0.5 cm and 5 cm.

1 47. A method as in claim 33, wherein the tissue volume between the  
2 transverse face of the electrode array and the transverse face of the second electrode is in  
3 the range from 30 cm<sup>3</sup> to 150 cm<sup>3</sup>.

1                   48. A method as in claim 33, wherein the distance between the termini  
2 of the first and second axial conductors is from 0.25 to 0.75 of the distance between the  
3 inner termini of the innermost portions of the first and second electrode arrays.

1                   49. A kit for treating a treatment region in tissue, said kit comprising:  
2                   a first array of electrodes which are deployable in tissue;  
3                   a second array of electrodes which are deployable in tissue; and  
4                   instructions for use setting forth a method according to claim 16 or 33.

1                   50. A kit as in claim 41, further comprising a package for holding the  
2 first electrode array, the second electrode array, and the instruction for use.

1                   51. A probe for deploying electrode arrays, said probe comprising:  
2                   a shaft having a distal end and a proximal end;  
3                   a first array of electrodes mounted on the shaft to shift between a retracted  
4 configuration and a deployed configuration; and  
5                   a second array of electrodes mounted on the shaft at a location spaced-  
6 apart proximally from the first array of electrodes, wherein the second electrode array  
7 shifts between a retracted and a deployed configuration;  
8                   wherein the first array is electrically isolated from the second array to  
9 permit the arrays to be connected to a power supply for bipolar operation.

1                   52. A probe as in claim 51, wherein the first and second electrode  
2 arrays each comprise a plurality of individual electrodes which initially move axially and  
3 then evert as they are deployed.

1                   53. A probe as in claim 51, wherein the shaft has a self-penetrating tip.

1                   54. A probe as in claim 51 or 53, wherein the shaft has at least one  
2 cavity for receiving the first and second electrode arrays when retracted.

1                   55. A probe as in claim 51 or 53, wherein the shaft has at least one  
2 cavity for receiving the first electrode array when retracted and at least a second cavity  
3 for receiving the second electrode array when retracted.

1                   56. A probe as in claim 51 or 53, further comprising:

2 a first rod connected to the first electrode array and slidably disposed in  
3 the shaft, wherein distal advancement of the first rod relative to the shaft causes the first  
4 electrode array to deploy distally;

5 a second rod connected to the second electrode array and slidably disposed  
6 in the shaft, wherein proximal retraction of the second rod relative to the shaft causes the  
7 second electrode array to deploy proximally.

1 57. A probe as in claim 56, wherein the first and second rods may be  
2 deployed separately.

1 58. A probe as in claim 51 or 53, wherein the first electrode array  
2 spans a planar area in the range between  $3\text{ cm}^2$  to  $20\text{ cm}^2$  when deployed, the second  
3 electrode array spans a planar area in the range between  $3\text{ cm}^2$  and  $20\text{ cm}^2$  when  
4 deployed, and the first and second areas are spaced-apart along a line between their  
5 respective centers by a distance in the range between 2 cm to 10 cm.

1 59. A probe as in claim 51 or 53, wherein the volume between the first  
2 electrode array when deployed and the second electrode when deployed is in the range  
3 from  $30\text{ cm}^3$  to  $150\text{ cm}^3$ .

1 60. A probe as in claim 59, wherein the volume is in the range from  
2  $50\text{ cm}^3$  to  $70\text{ cm}^3$ .

1 61. A probe as in claim 51 or 53, wherein the first electrode array and  
2 second electrode array are electrically isolated from each other, further comprising a first  
3 connector for connecting the first electrode array to one pole of a power supply and a  
4 second connector for connecting the second array to a second pole of a power supply.

1 62. A probe as in claim 61, further comprising a first axial conductor  
2 extending proximally along the shaft from the first electrode array to a location distal to  
3 the second electrode array, said first axial conductor being electrically coupled to the first  
4 electrode array.

1 63. A probe as in claim 62, wherein the first axial conductor extends  
2 proximally beyond the proximal terminus of the first electrode array so that the first axial

3 conductor lies closer to the second electrode array than does any portion of the first  
4 electrode array.

1 64. A probe as in claim 62, further comprising a second axial  
2 conductor extending distally along the shaft from the second electrode array to a location  
3 proximal to the first axial conductor so that a gap exists between the termini of the first  
4 and second axial conductors, said second axial conductor being electrically coupled to the  
5 second electrode array.

1 65. A probe as in claim 64, wherein the second axial conductor extends  
2 distally beyond the distal terminus of the second electrode array so that the second axial  
3 conductor lies closer to the first electrode array than does any portion of the second  
4 electrode array.

1 66. A probe as in claim 64, wherein the distance between the inner  
2 termini of the first and second axial conductors is from 0.25 to 0.75 of the distance  
3 between the inner termini of the innermost portions of the first and second electrode  
4 arrays.